

**CLAIMS**

1           A method of determining, measuring and comparing the oxidative radical  
5 activity in a natural or synthetic substance including the measuring by SIFT-MS technology  
of the oxidative free radical and scavenging activities in a gas sample taken from the  
headspace of the substance to be measured, comprising measuring the concentration of  
ethylene as an assay for antioxidant activity to provide a measurement of the concentration  
of the analyte to thereby indicate the total activity of an antioxidant and the rate of reaction of  
10 the antioxidant with the substrate, the method comprising  
producing, mass selecting and accelerating precursor ions into a stream of inert  
carrier gas,  
injecting a mixture of the gas sample and the analyte into the carrier gas/ion stream,  
allowing the ethylene in the reaction mixture head space to react with the selected  
15 precursor ions,  
detecting, amplifying and analysing the amount and rate of ethylene produced in the  
reaction mixture headspace as a measure of the rate and amount of introduced analyte  
antioxidant activity.

20 2.       The method as claimed in claim 1, wherein the trace elements in the gas sample react  
with the precursor ions in the helium stream.

3.       The method as claimed in claim 1, wherein the partial pressure of ethylene in the gas  
sample is calculated as part of the measurement of the rate and amount of introduced analyte.

25 4.       The method as claimed in claim 1, wherein the gas sample is introduced into the  
carrier gas/ion stream at a calibrated rate via a heated capillary inlet.

30 5.       The method as claimed in claim 1, wherein the concentration of each gas species of  
volatile organic compounds in the gas mixture is calculated from the number densities of the  
precursor and product ions.

6. The method of claim 6, wherein the number densities are measured by a second mass filter in conjunction with a particle multiplier and a software interface.